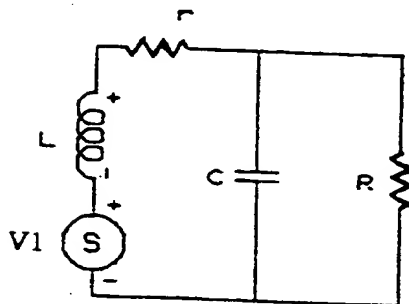


Figure 1: Prior Art Transponder



$$1/Q_t = 1/Q_c + 1/Q_i$$

$$Q_c = \omega RC \quad Q_i = \omega L/r$$

$$1/R = 1/R(\text{modulator}) + 1/R(\text{chip})/2$$

Figure 2: Tuned Circuit Model

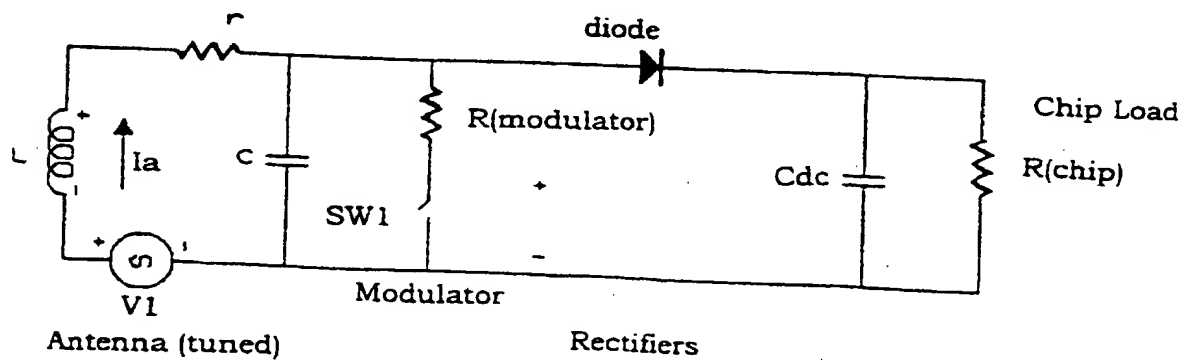


Figure 3: Electrical Model for Prior Art Circuit

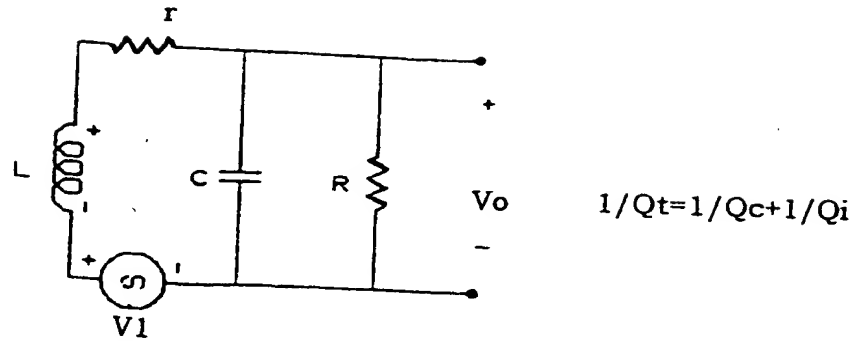


Figure 4(a): Data Rate Limited due to Q factor

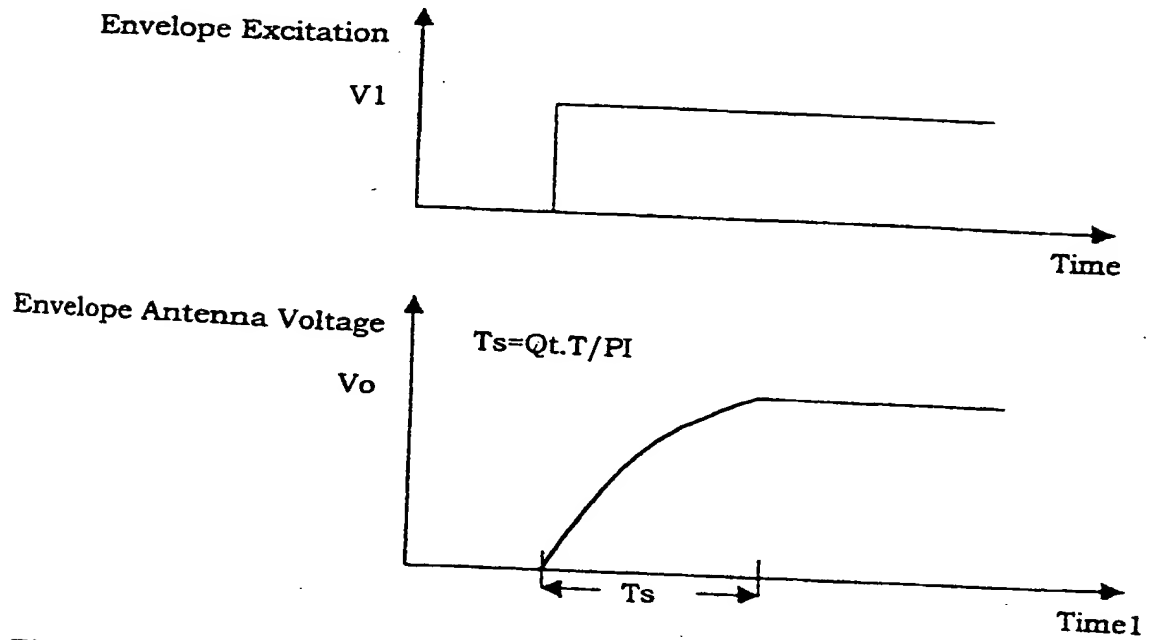


Figure 4(b): Envelope of Waveform associated with Q factor

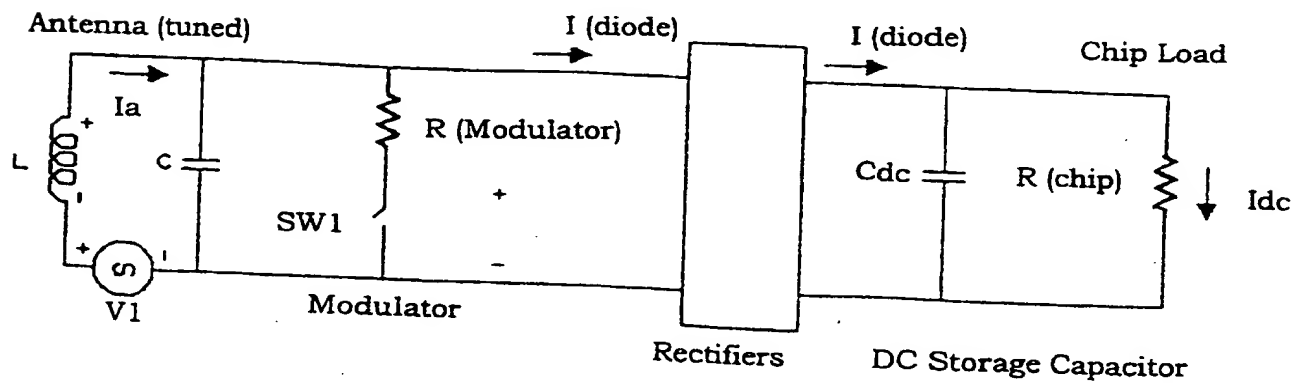


Figure 4(c): Data Rate Limit due to DC Storage System

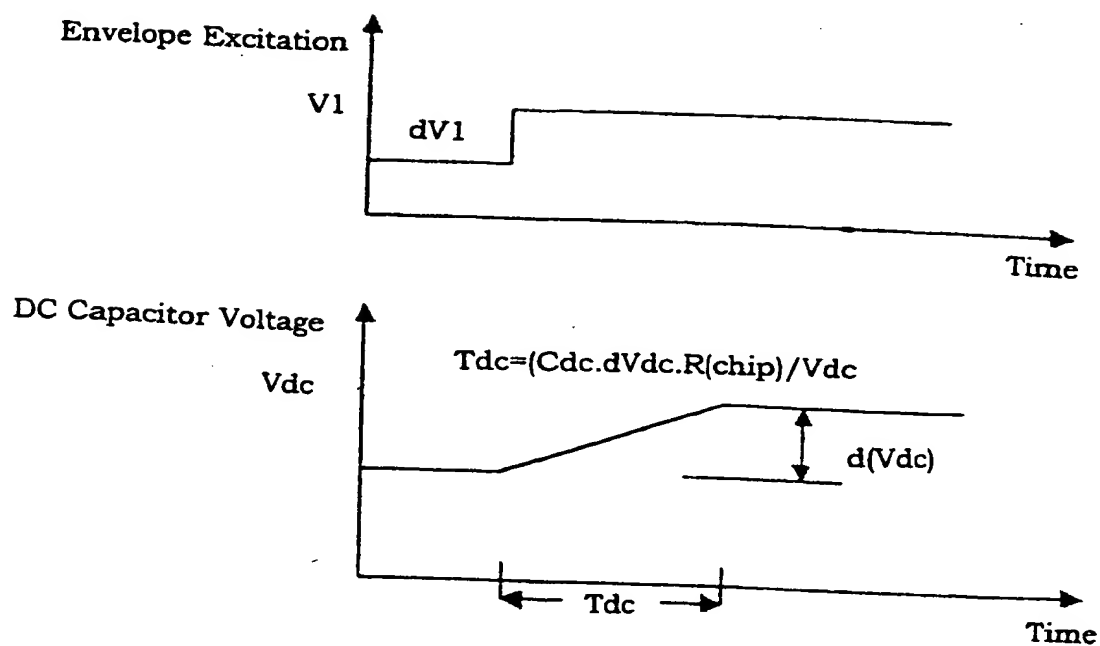
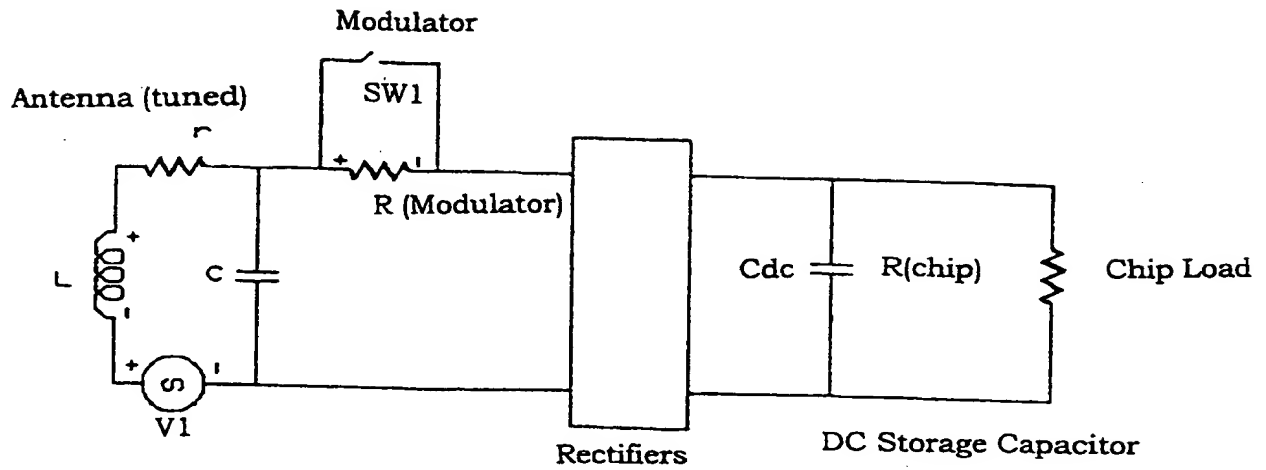
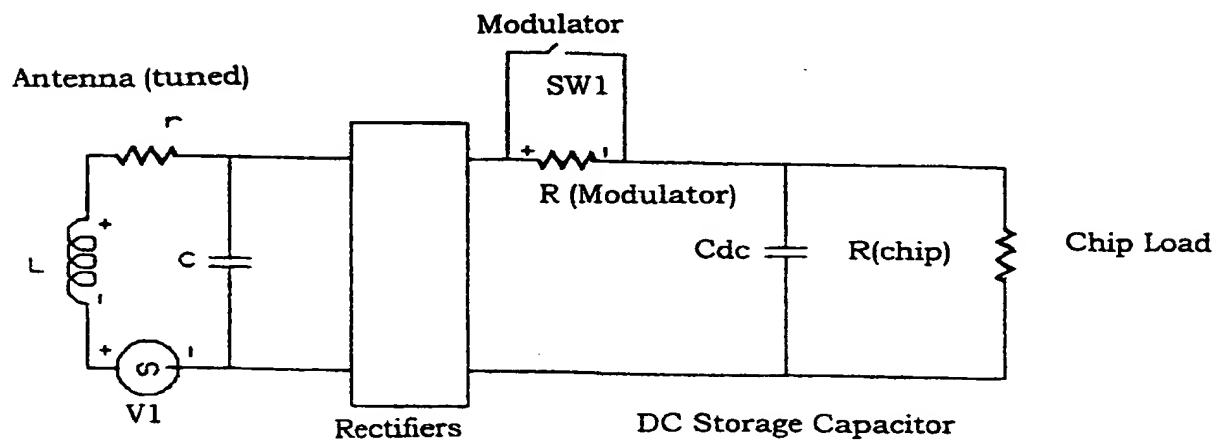


Figure 4(d): DC Waveform associated with DC Storage Limit

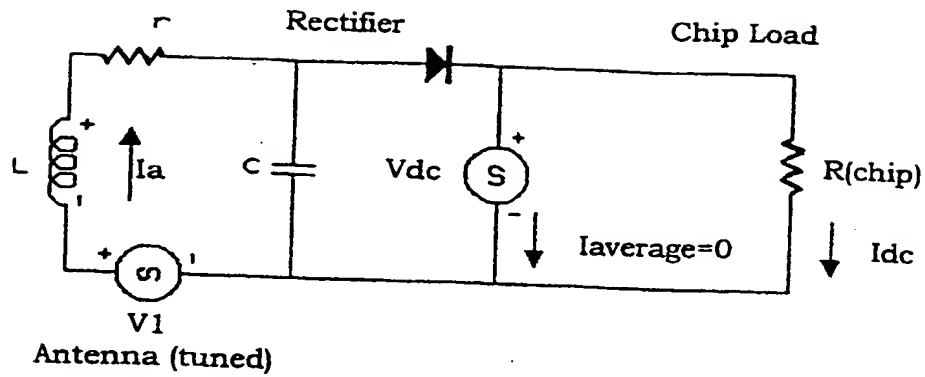


**Figure 5(a): Invention with Modulator in AC part of Circuit**

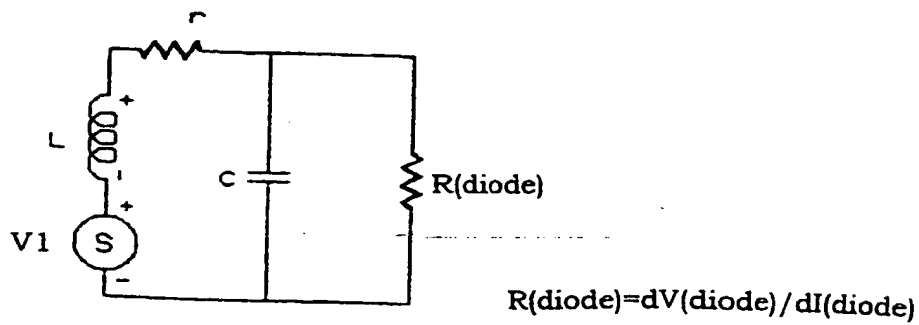


**Figure 5(b): Invention with Modulator in DC part of Circuit**

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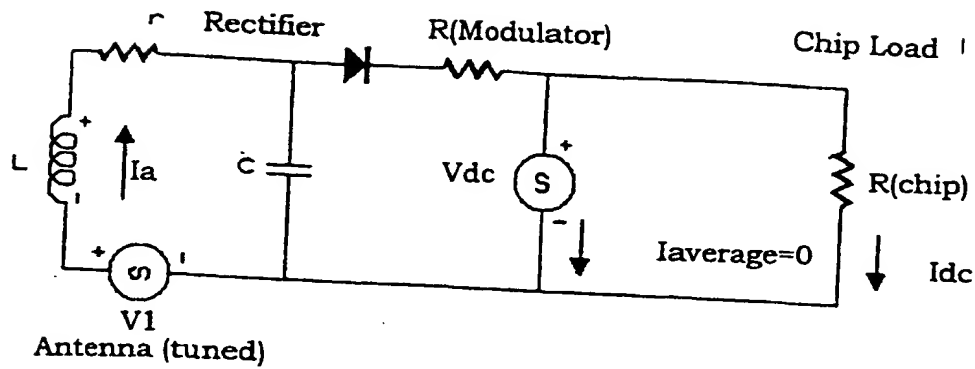


**Figure 6(a): Electrical Model for Invention with SW1 Closed**

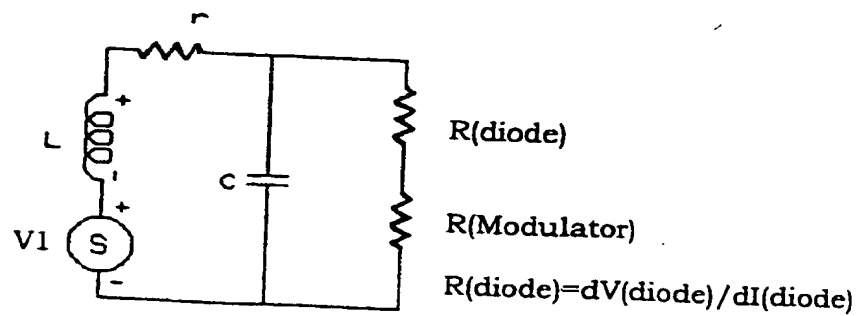


**Figure 6(b): Electrical Model for Invention with SW1 Closed**

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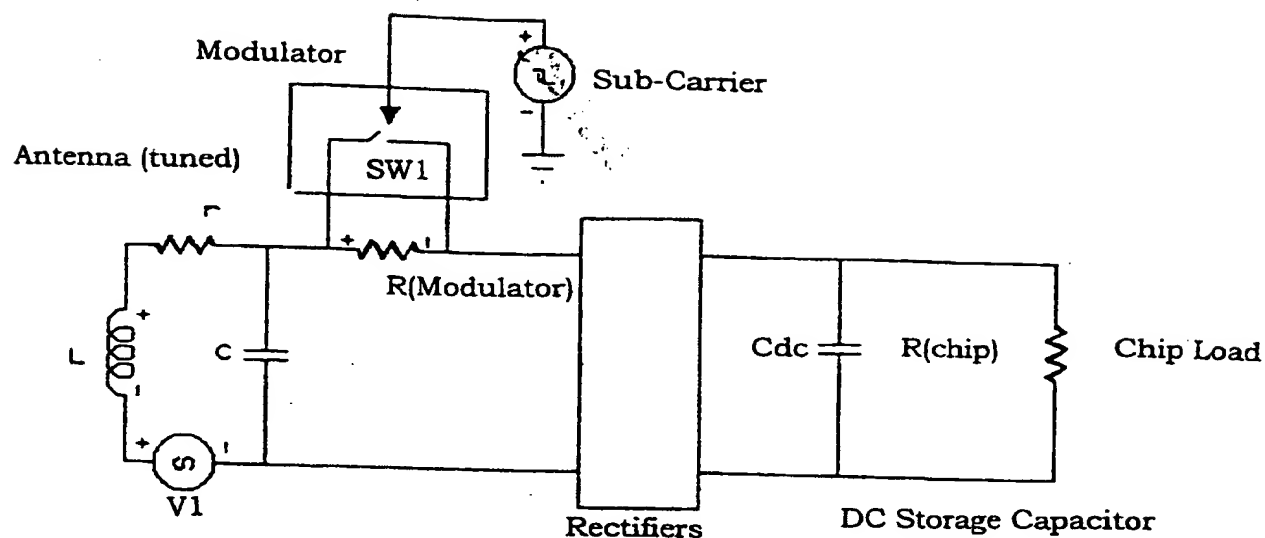


**Figure 7(a): Electrical Model for Invention with SW1 Open**

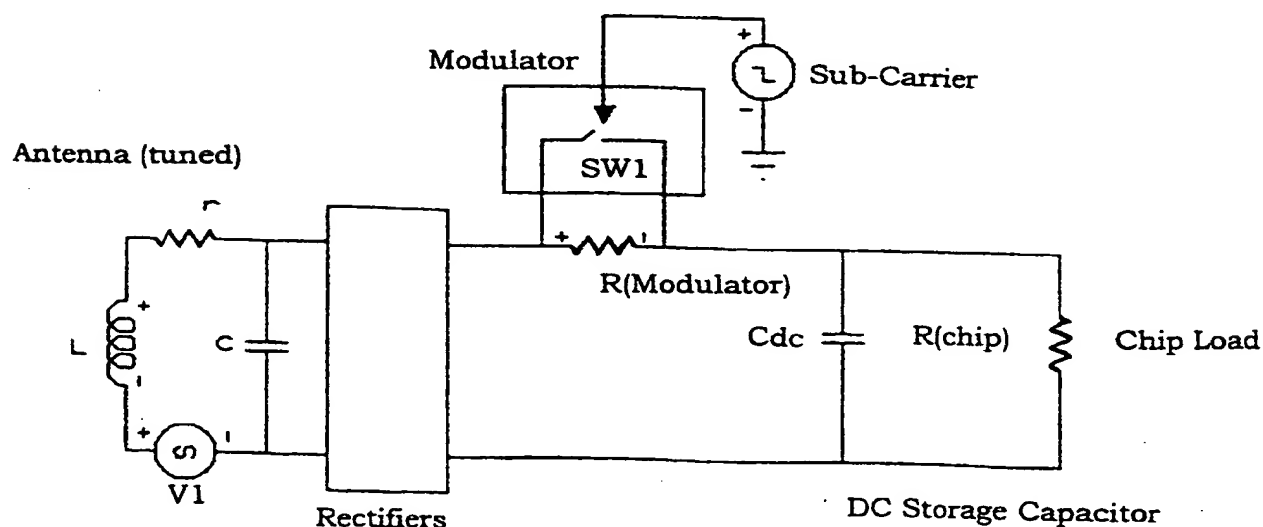


**Figure 7(b): Electrical Model for Invention with SW1 Open**

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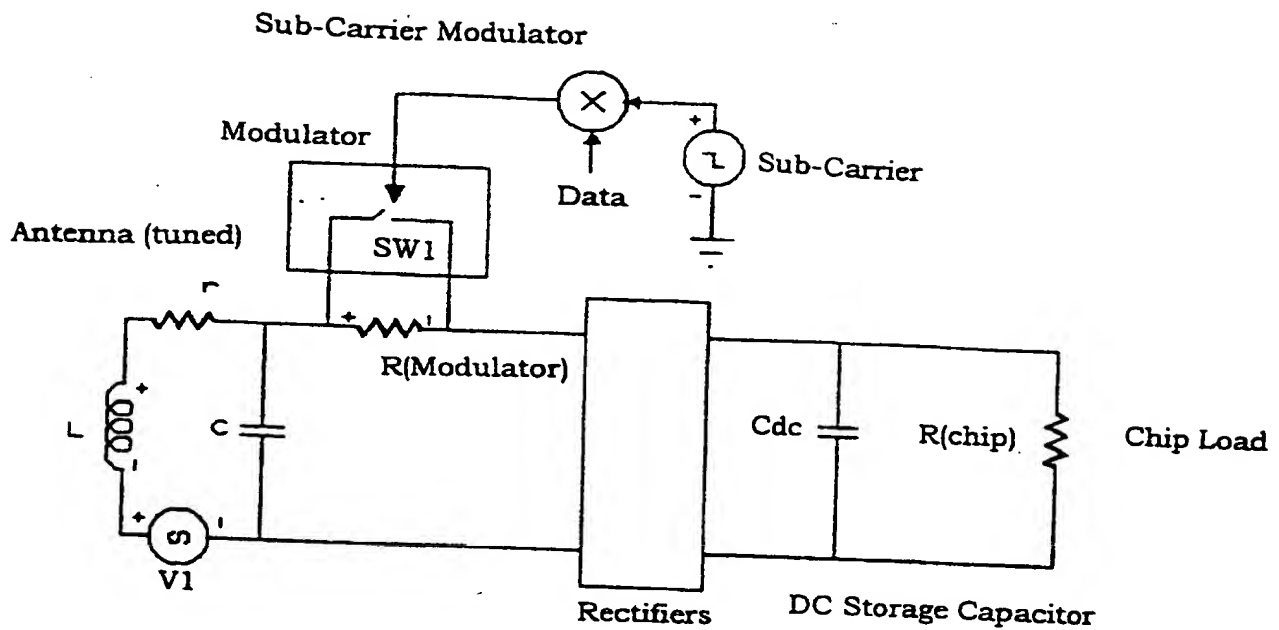


**Figure 8(a): Invention with Sub-Carrier Modulation of Modulator in AC Circuit**

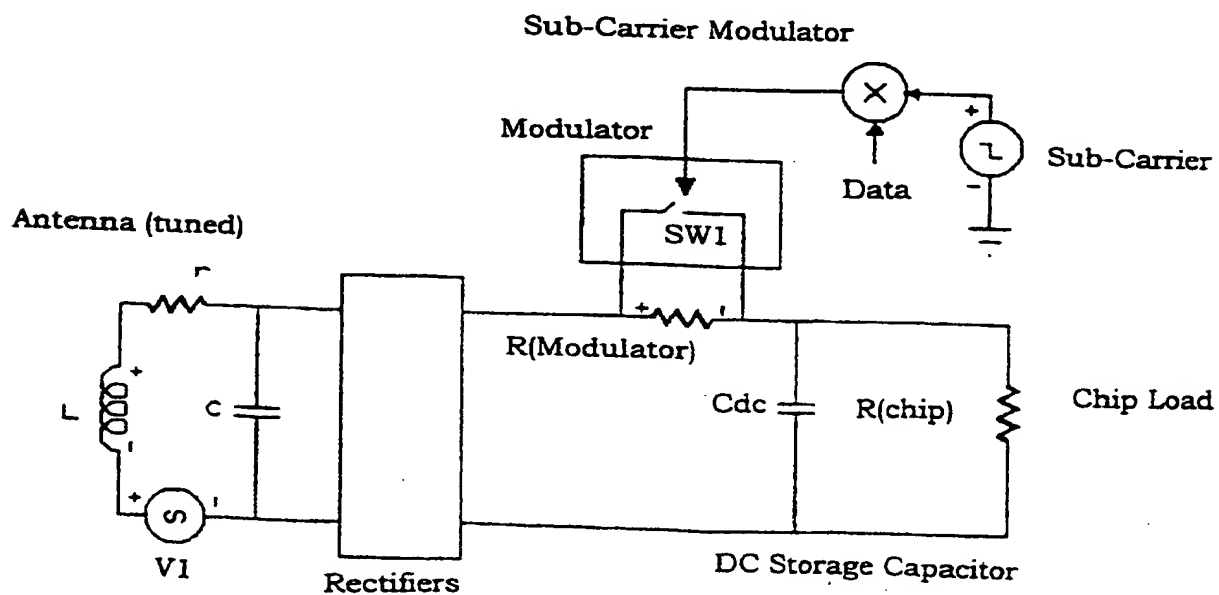


**Figure 8(b): Invention with Sub-Carrier Modulation of Modulator in DC Circuit**

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**Figure 9(a): Invention with Data Modulated onto Sub-Carrier with Modulator in AC Circuit**



**Figure 9(b): Invention with Data Modulated onto Sub-Carrier with Modulator in DC Circuit**



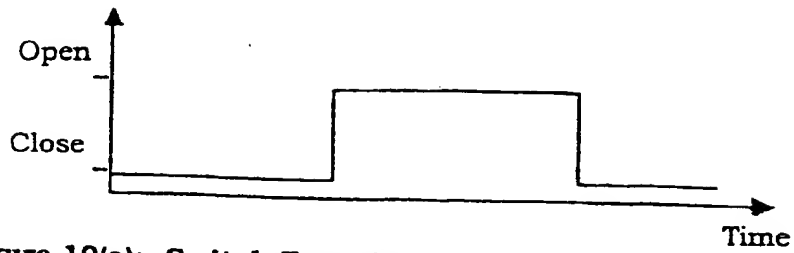


Figure 10(a): Switch Function

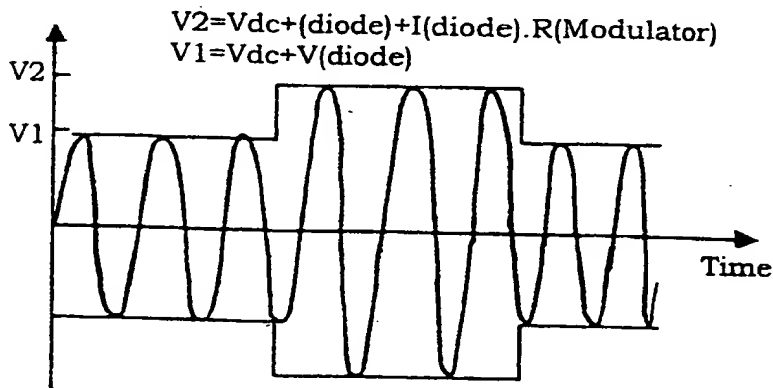


Figure 10(b): Antenna Voltage

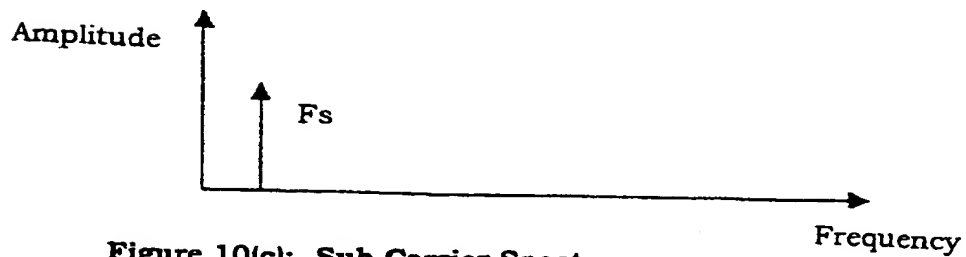


Figure 10(c): Sub-Carrier Spectrum

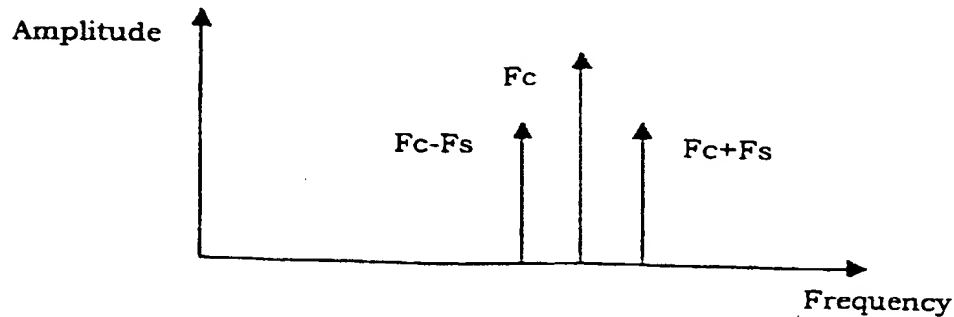


Figure 10(d): Sub-Carrier Amplitude Modulation Sidebands



Figure 10(e): Data Spectrum



Figure 10(f) Data Spectrum Modulated onto Sub-Carrier

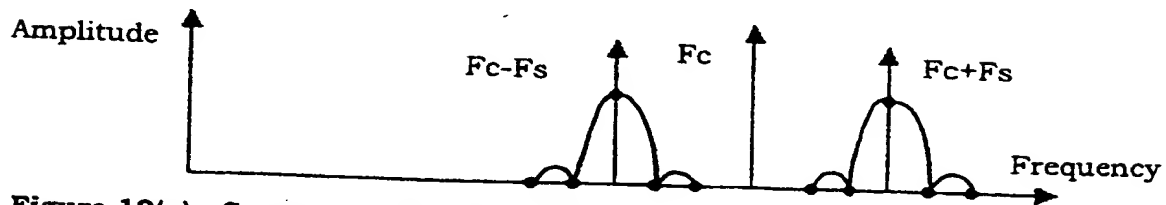


Figure 10(g): Spectrum Data Modulated Sub-Carrier Amplitude Modulated onto Excitation Frequency

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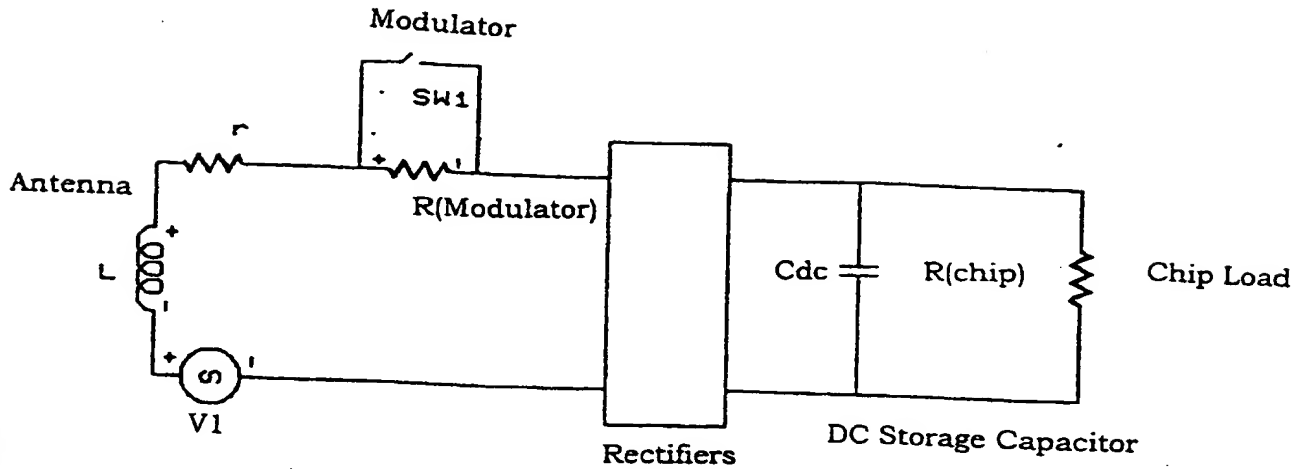


Figure 11(a): Invention with Modulator in AC part of Circuit where Antenna is Untuned

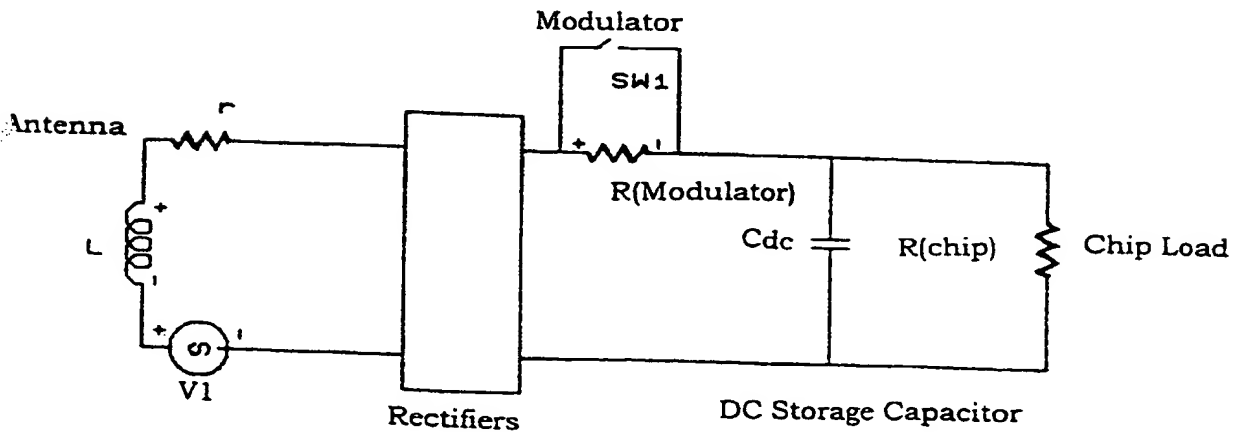


Figure 11(b): Invention with Modulator in DC part of Circuit where Antenna is Untuned

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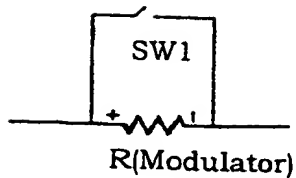


Figure 12(a) Simple Switch Modulator

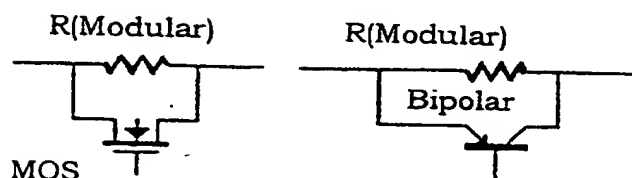


Figure 12(b): Examples of Modulation Switches

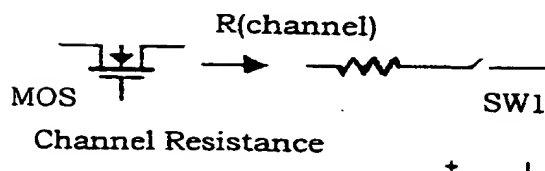


Figure 12(c): Use of Channel Resistance to make Switchable Resistances

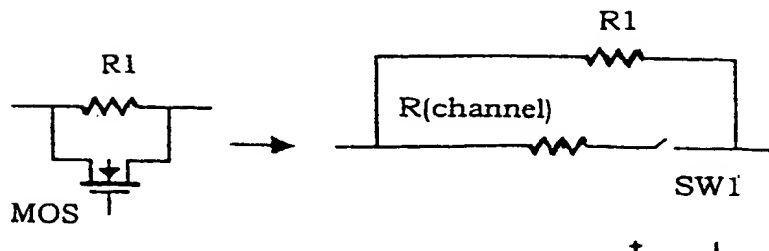


Figure 12(d): Resistance varied between Two Values

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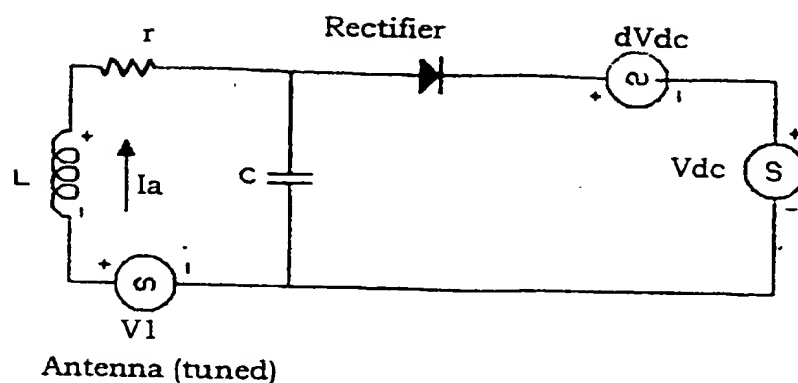


Figure 13(a): Electrical Model for Small change in DC Storage Voltage

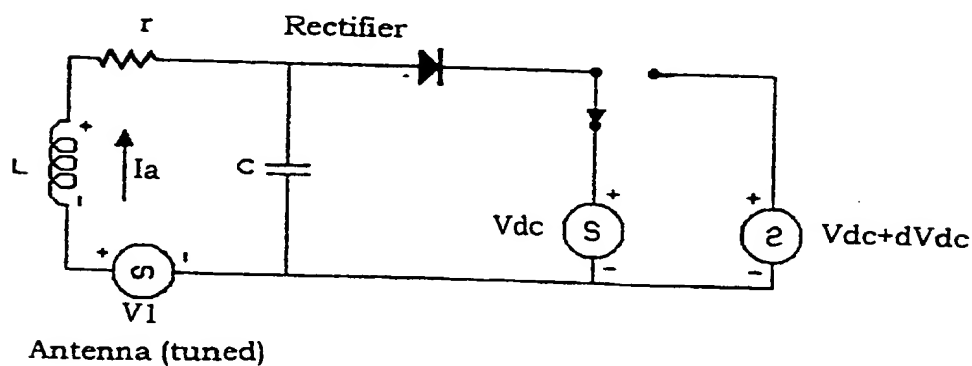


Figure 13(b): Electrical Model for Step Change in DC Voltage

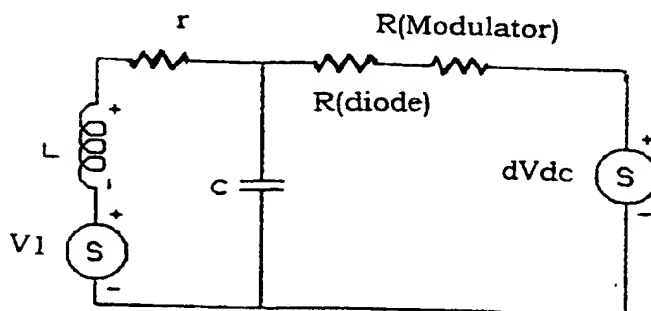


Figure 14: Electrical Model for Compensation Theorem Derive Modulator

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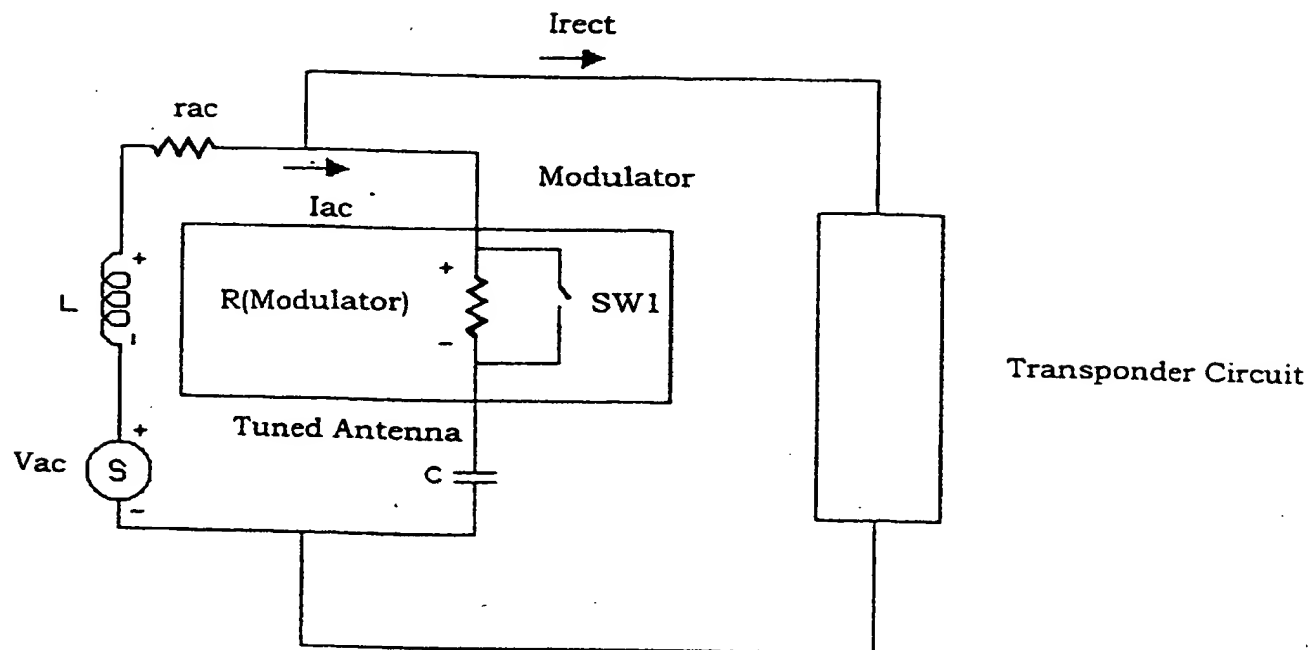


Figure 15(a): Invention with Transponder connected across Coil

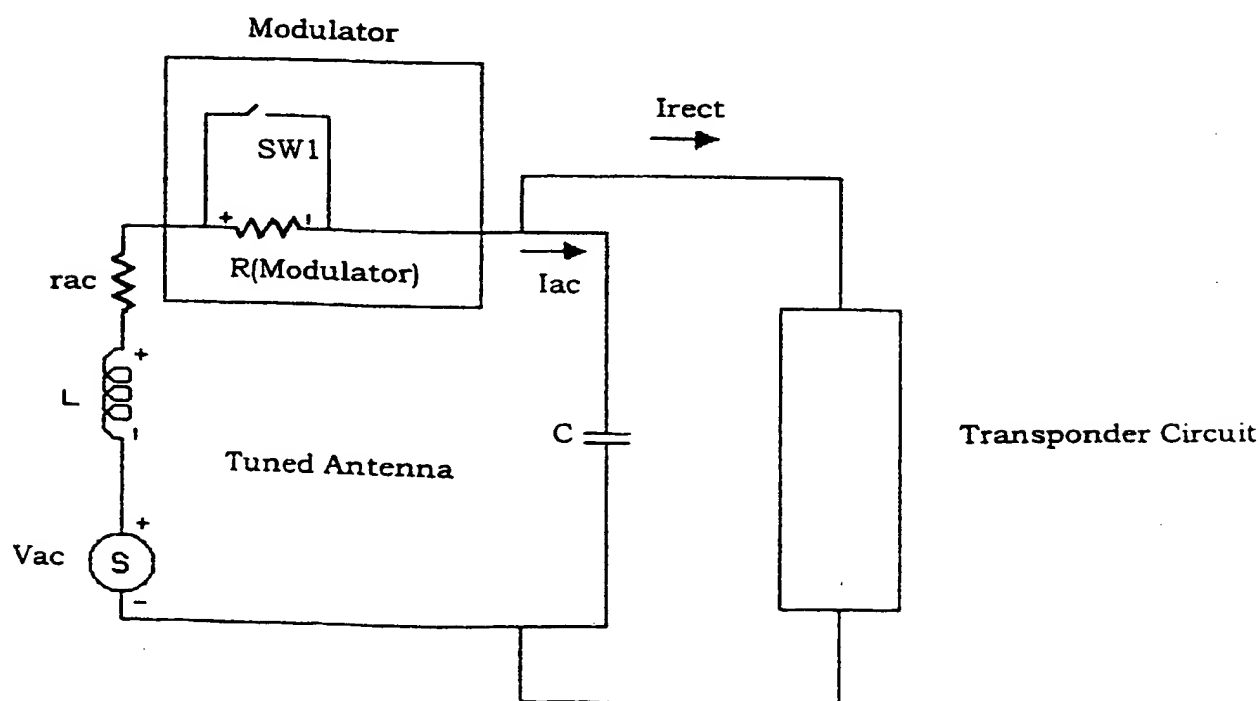
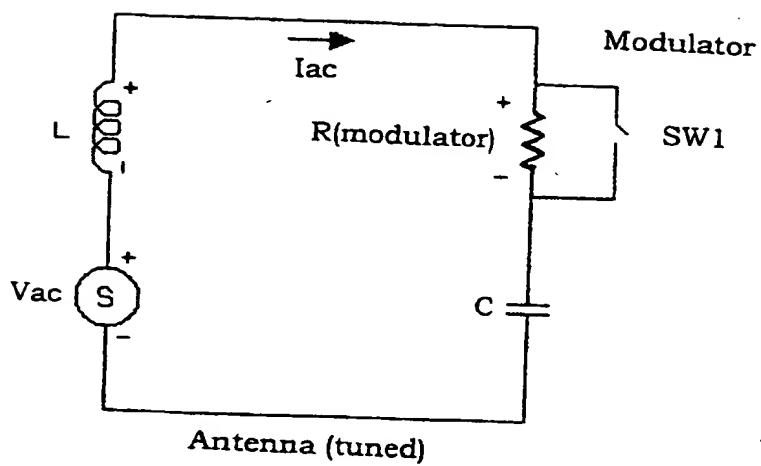
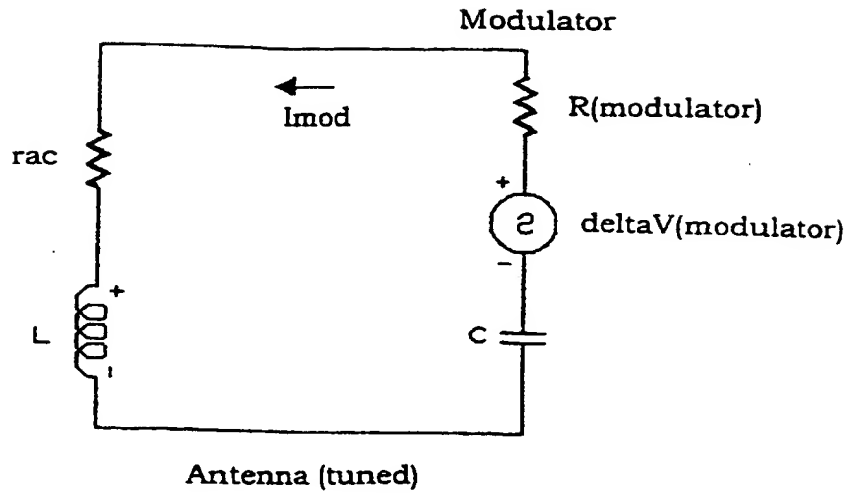


Figure 15(b): Invention with Transponder connected across Tuning Capacitor

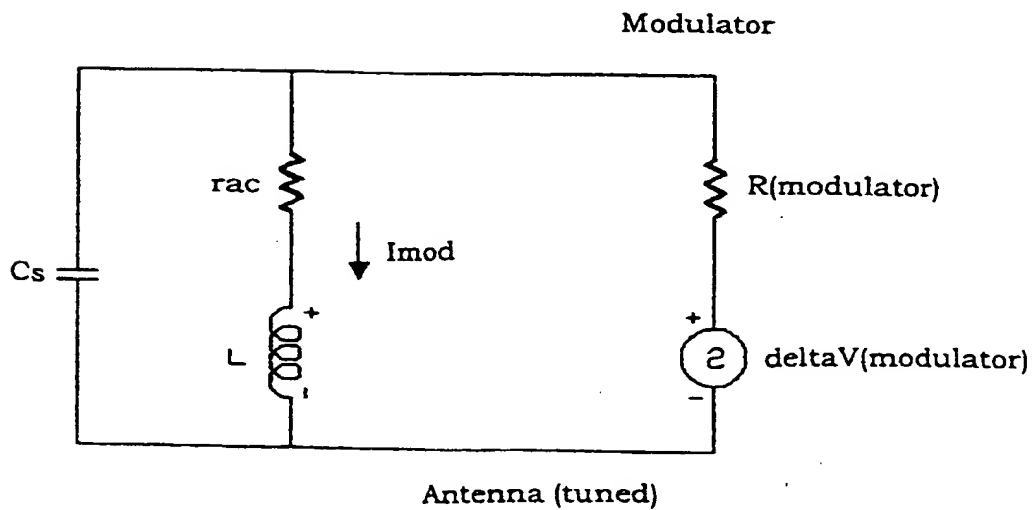
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**Figure 16: Embodiment of Invention**

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**Figure 17(a): Electrical Model of the Invention at Tuned Frequency**



**Figure 17(b): Electrical Model of the Invention at Radio Frequency**



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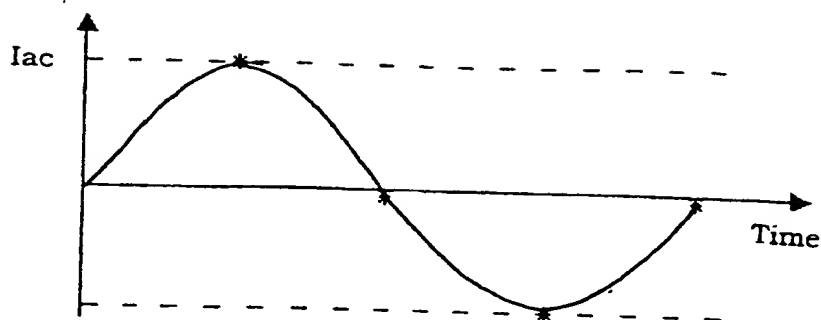


Figure 18(a): Coil Resonant Current  $I_{ac}$

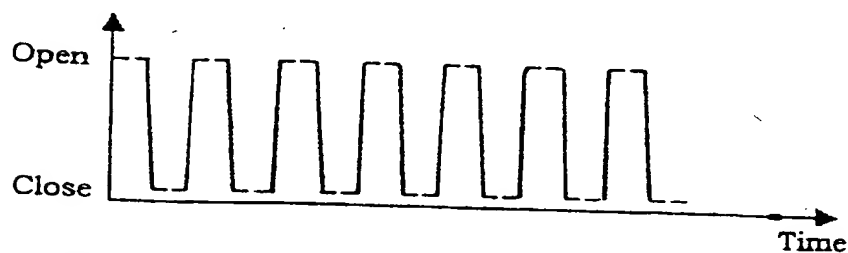


Figure 18(b): Switch Function

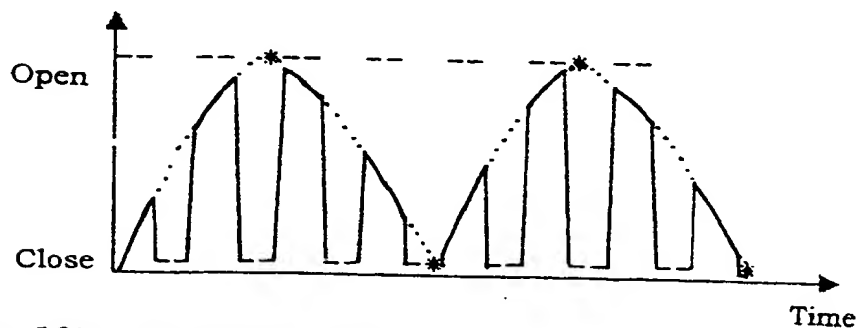


Figure 18(c): Magnitude of  $V(\text{modulator})$

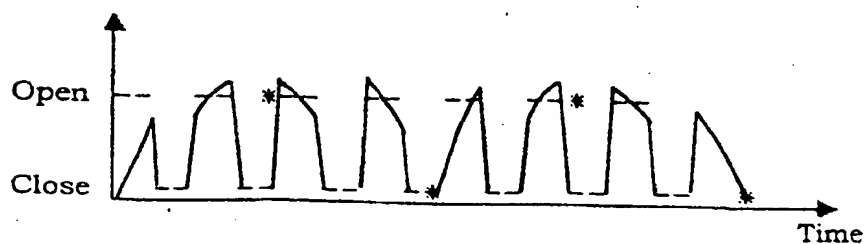


Figure 18(d): Magnitude of  $V(\text{modulator})$  with Waveshaping

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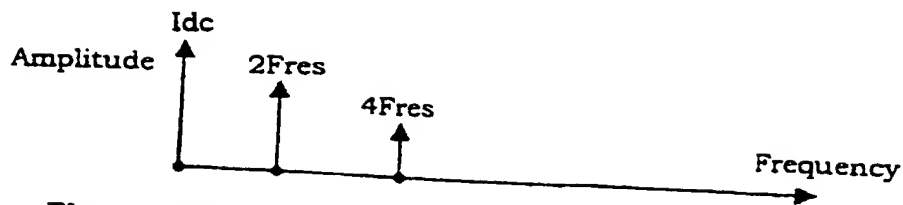
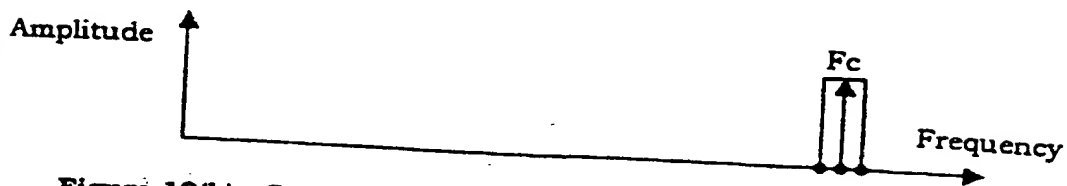
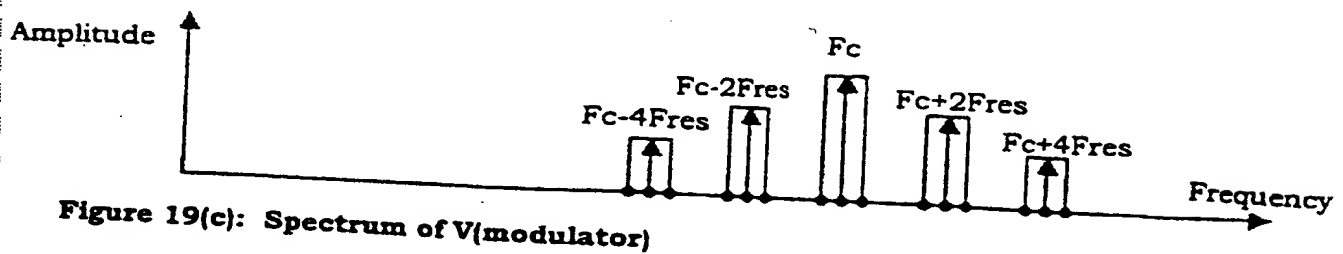
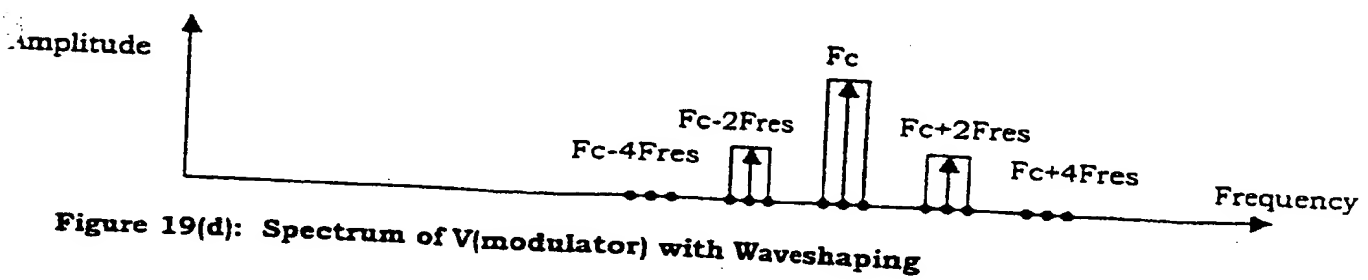
Figure 19(a): Spectrum of  $I_{ac}$  Fullwave Rectified

Figure 19(b): Carrier Modulated with Data

Figure 19(c): Spectrum of  $V(\text{modulator})$ Figure 19(d): Spectrum of  $V(\text{modulator})$  with Waveshaping

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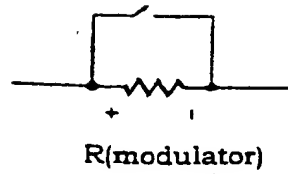


Figure 20(a): Simple Switch Modulator

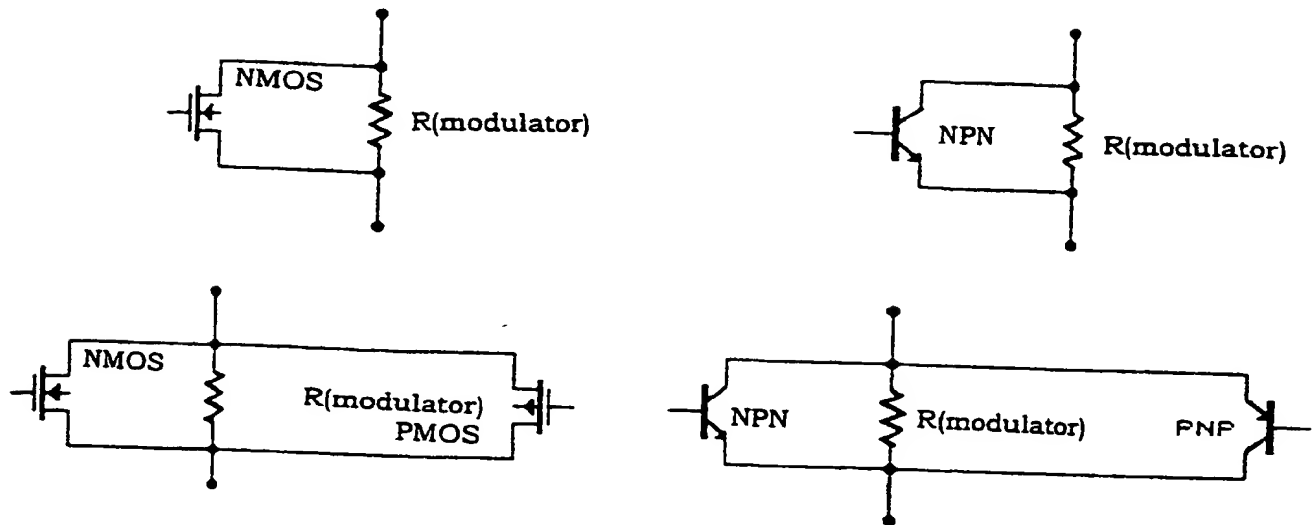


Figure 20(b): Examples of Modulation Switches

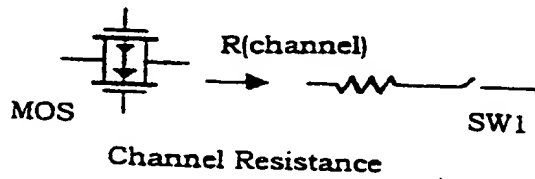


Figure 20(c): Use of Channel Resistance to make Switchable Resistances

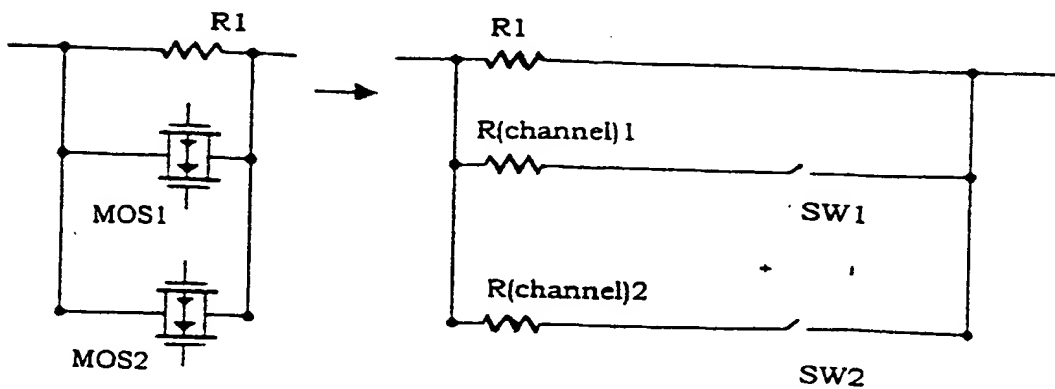


Figure 20(d): Resistance varied between several values

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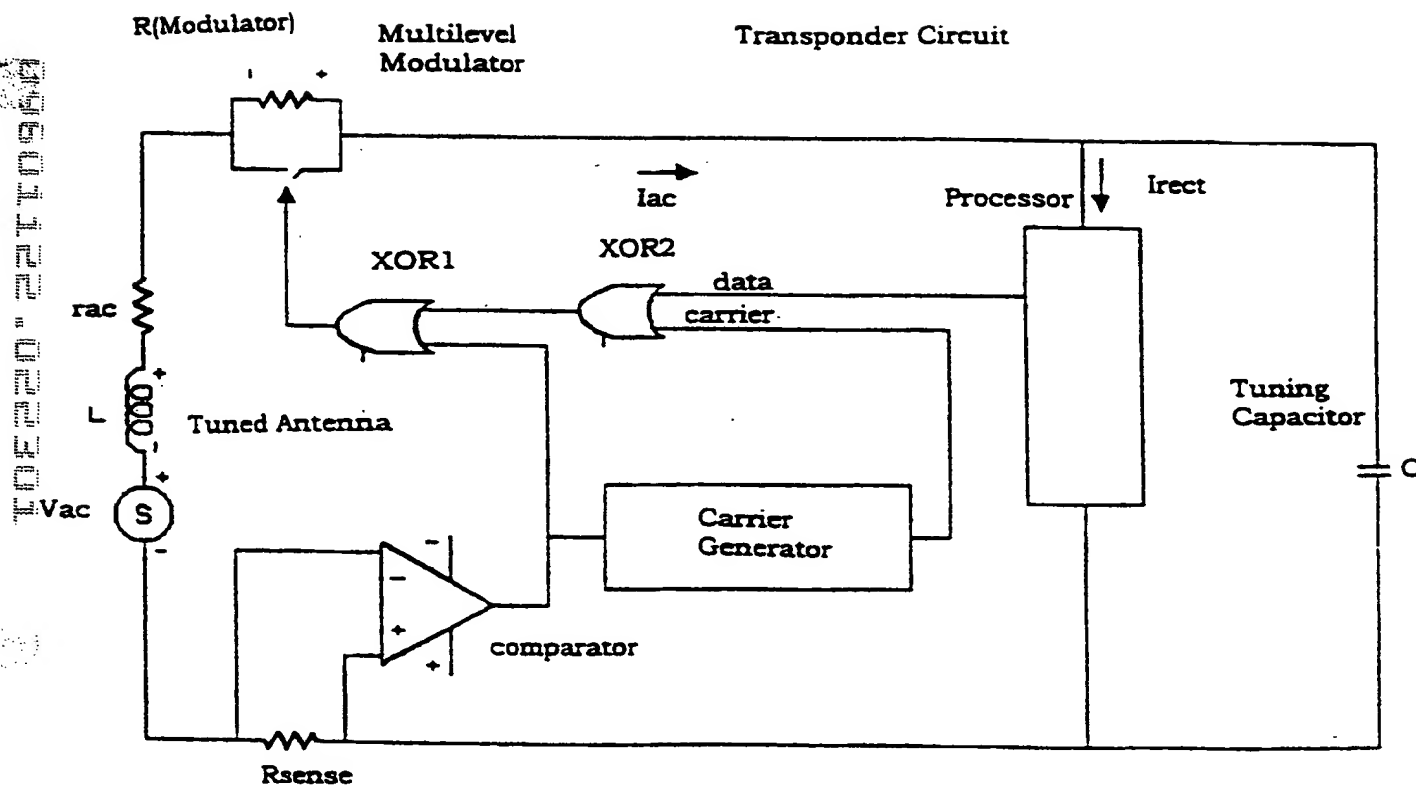


Figure 21: Circuit embodiment of Invention

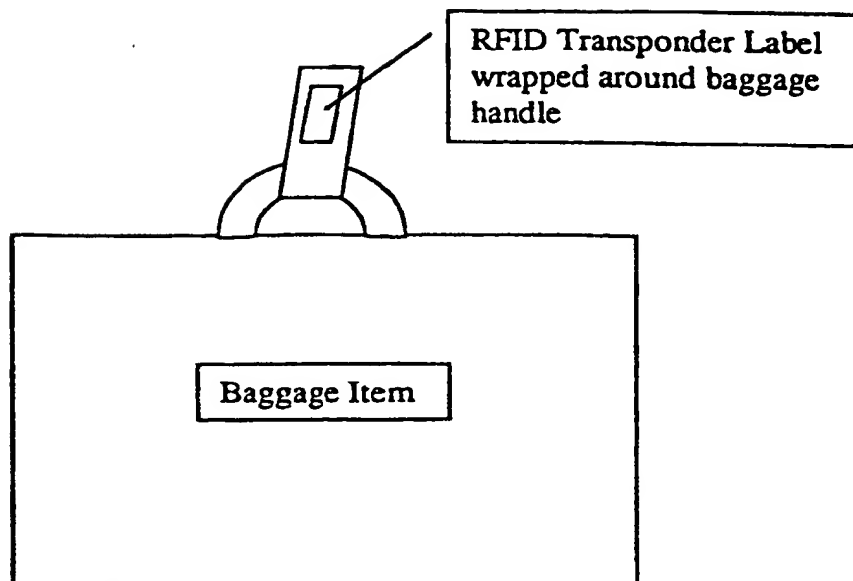


Figure 22 : Baggage item with RFID transponder label

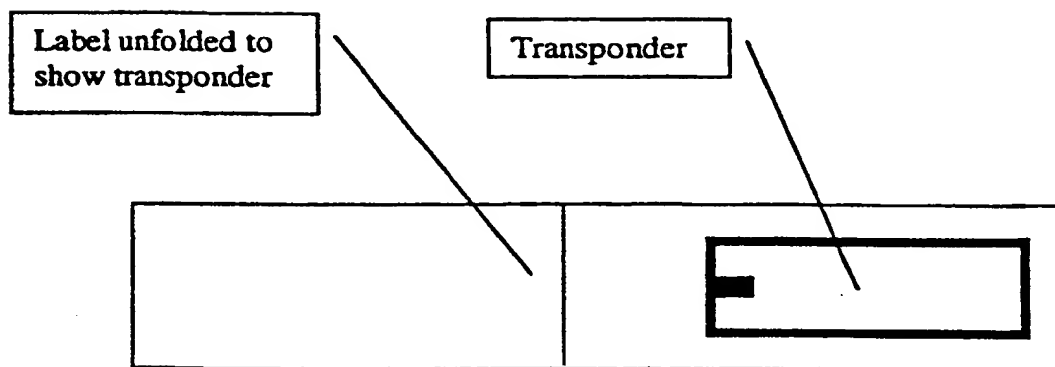


Figure 23 : RFID transponder on baggage label

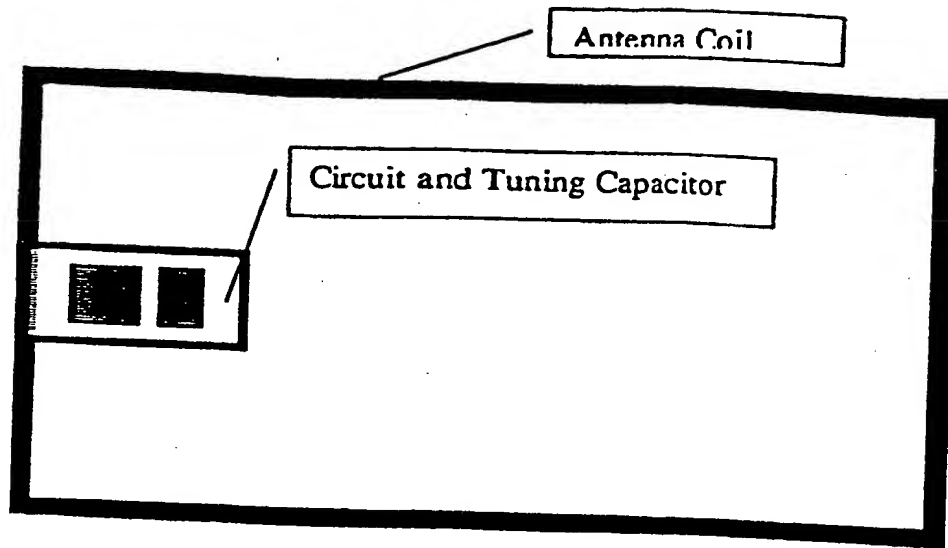


Figure 24 : Transponder Antenna Coil, Tuning Capacitor and Circuit

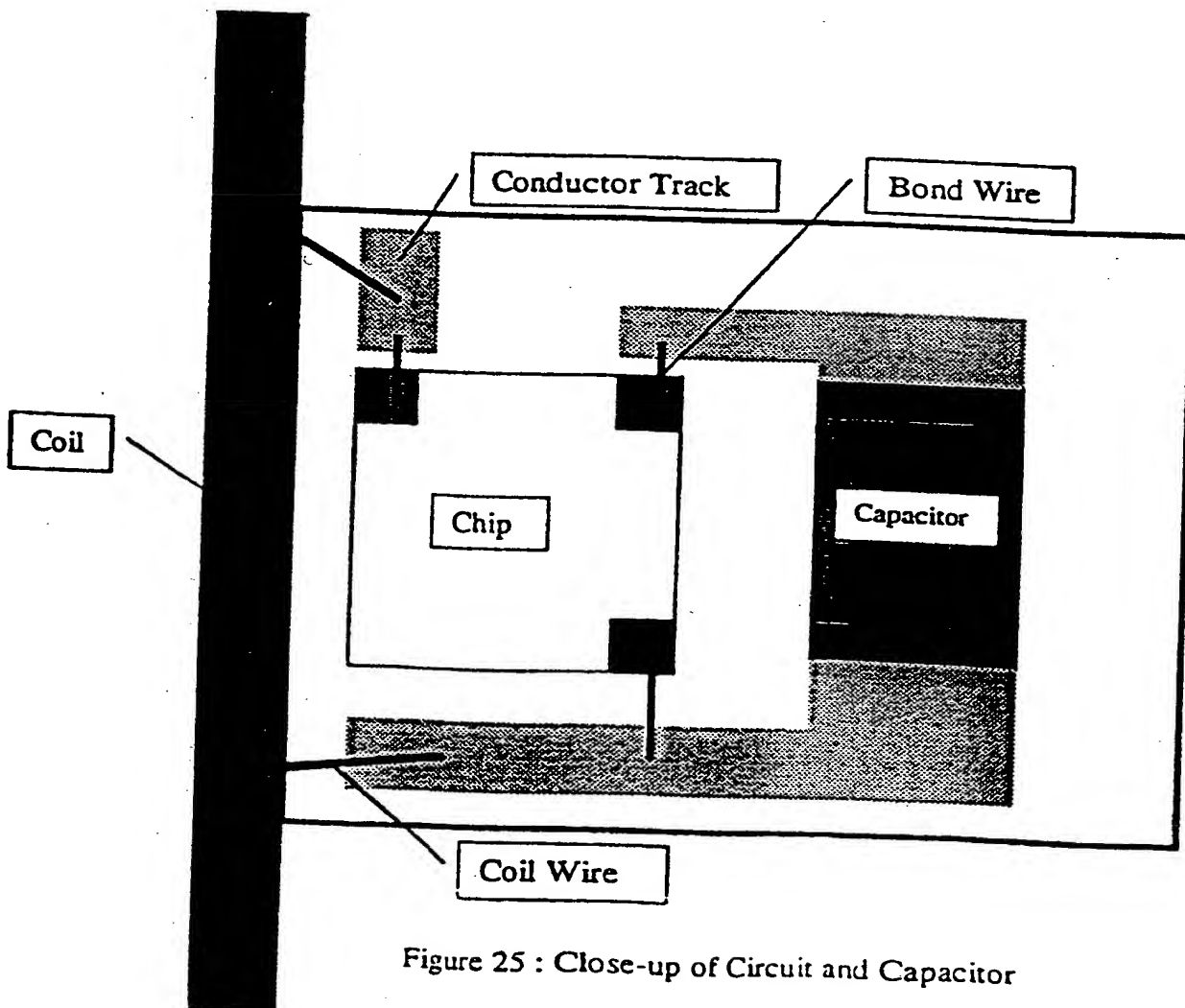


Figure 25 : Close-up of Circuit and Capacitor